Attachment 14: Revised Occupational and Residential Exposure

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF
PREVENTION, PESTICIDES AND
TOXIC SUBSTANCES

July 30, 1999

MEMORANDUM

SUBJECT: OCCUPATIONAL AND RESIDENTIAL EXPOSURE AND RISK ASSESSMENT AND RECOMMENDATIONS FOR THE REREGISTRATION ELIGIBILITY DECISION DOCUMENT FOR METHYL PARATHION. (PC 053501 and DP Barcode D239744)

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Please find attached a revised occupational exposure and risk assessment for the use of methyl parathion. The original risk assessment has been updated to address public comments received during Phase 4.

DB Barcode: D239744

Pesticide Chemical Code: 053501

EPA Reg Nos: 279-2149, 279-2609, 1812-399, 1812-405, 2935-482, 2935-527, 2935-528, 4581-292, 4787-28, 5481-175, 5481-307, 5481-437, 5905-198, 5905-515, 5905-528, 9779-344, 19713-37, 19713-281, 19713-322, 19713-324, 34704-715, 34704-794, 34704-795, 51036-284, 67760-29, and 67760-39.

PHED: Yes, Version 1.1

EXECUTIVE SUMMARY

Methyl parathion, O, O-Dimethyl O-(4-nitrophenyl) phosphorothioate, is an acaricide and an insecticide registered for use on a variety of crops. It is a restricted use pesticide that is formulated as a microencapsulate (20.9 percent active ingredient), and an emulsifiable concentrate (ranges from 11.2 to 54.8 percent active ingredient). Methyl parathion can be applied with aerial equipment, airblast sprayer (microencapsulated formulation only), chemigation (microencapsulated formulation only), and groundboom equipment. Both the registrant's proposed maximum application rates and the current label maximum application rates were used in this assessment. These application rates vary from 0.25 to 3.0 pounds active ingredient per acre depending upon the exposure scenario and crop. Additionally, the recent mitigation measures for methyl parathion were included in this assessment.

At this time, products containing methyl parathion are intended for occupational uses. Methyl parathion is a restricted-use pesticide and is only available for retail sale to and for use by certified applicators (or persons under their direct supervision) and only for those uses covered by the certified applicator's certification. There are no homeowner uses, however, residential exposure could occur via agricultural spray drift from the use of methyl parathion on adjacent fields or from the use of methyl parathion as a mosquito control agent.

HED has determined that there are potential exposures to mixers, loaders, applicators, and other handlers during usual use-patterns associated with methyl parathion. Based on the use patterns of methyl parathion, twelve major exposure scenarios were identified: (1a) mixing/loading liquids (emulsifiable concentrate) for aerial application; (1b) mixing/loading liquids (emulsifiable concentrate) for groundboom application; (2a) mixing/loading liquids (microencapsulated) for aerial/chemigation application; (2b) mixing/loading liquids (microencapsulated) for groundboom application; (2c) mixing/loading liquids (microencapsulated) for airblast application; (3) applying sprays with aerial equipment (emulsifiable concentrate); (4) applying sprays with aerial equipment (microencapsulated); (5) applying sprays with groundboom equipment (emulsifiable concentrate); (6) applying sprays with groundboom equipment (microencapsulated); (7) applying sprays with airblast sprayer (microencapsulated); (8) flagging sprays (emulsifiable concentrate); and (9) flagging sprays (microencapsulated).

Calculations of risk based on combined dermal and inhalation exposure indicate that the MOEs are **not more than 100** even with maximum risk reduction measures for **all** of the short and intermediate term occupational exposure scenarios listed above **except** for two flagger exposure scenarios with engineering controls at the lowest application rates.

Depending on crop and postapplication activities, re-entry intervals are estimated to range up to 30 days for microencapsulated formulations and from 7 to 9

days for emulsifiable concentrate formulations.

Although methyl parathion is a restricted use pesticide that is only to be applied by certified applicators, HED believes that residential exposures may occur in several situations. First, residential exposures may occur from the use of methyl parathion as a mosquito control agent. Second, even though methyl parathion is a restricted use pesticide and some (but not all) labels state “Not for home use”, the possibility exists for residential post-application exposure from commercial application of methyl parathion to homeowner orchards. HED believes that this occurs infrequently and that the risks from this situation may be best addressed by changes in label language to explicitly state that the use of methyl parathion around residences is prohibited. Finally, residential exposures may result from spray drift from the aerial application of methyl parathion to agricultural fields. HED believes that these exposures may occur frequently with increasing urban encroachment on agricultural lands.

Risk estimates of residential dermal and inhalation exposures were not estimated. The Agency is currently developing methods to assess residential risks, and these risks will be assessed in the future when these new methods are available. However, based on available information, HED remains concerned about residential risks from methyl parathion spray drift.

A quantitative exposure and risk assessment for mosquito control has not be completed as part of this document. The magnitude of the occupational and residential cannot currently be estimated because HED lacks necessary data. Guideline studies needed to fill these data gaps include those related to applicator exposure (3 studies), postapplication exposure (5 studies), and spray drift (3 studies).

OCCUPATIONAL AND RESIDENTIAL EXPOSURE AND RISK ASSESSMENT FOR THE USE OF METHYL PARATHION

In this document, which is for use in the Agency's development of the Methyl Parathion Reregistration Eligibility Decision Document (RED), HED presents the results of its occupational exposure and risk assessment for the use of methyl parathion.

An occupational and/or residential exposure assessment is required for an active ingredient if (1) certain toxicological criteria are triggered and (2) there is potential exposure to handlers (mixers, loaders, applicators, etc.) during use or to persons entering treated sites after application is complete.

Occupational and Residential Use Patterns

Methyl parathion, O, O-Dimethyl O-(4-nitrophenyl) phosphorothioate, is an acaricide and an insecticide registered for use on a variety of crops. Methyl parathion, a restricted use pesticide, is formulated as a microencapsulate (20.9 percent active ingredient), and an emulsifiable concentrate (ranges from 11.2 to 54.8 percent active ingredient).[1] Methyl parathion's emulsifiable concentration is also formulated with ethyl parathion, endosulfan, and malathion.

Methyl parathion can be applied with aerial equipment, airblast sprayer (microencapsulated formulation only), chemigation (microencapsulated formulation only), and groundboom equipment. Both the registrant's proposed maximum application rates and the current label maximum application rates were used in this assessment. These application rates vary from 0.25 to 3.0 pounds active ingredient per acre depending upon the exposure scenario and crop.

This chapter includes all the pre mitigation uses for methyl parathion as well as the post mitigation uses for methyl parathion. The following crops are being supported by the registrant and include all pre mitigation uses:

Food, Forage, Feed and Fiber Crops: Alfalfa, artichoke, barley, beans, beets, broccoli, brussel sprouts, cabbage, carrot, cauliflower, celery, collards, corn, cotton, grass forage/fodder/hay, hops, kale, lentils, lettuce, mustard, oats, onion, pastures, peas, peanuts, potato, rangeland, rape, rice, rye, soybeans, spinach, sugar beet, sunflower, sweet potato, tomato, turnip, wheat, and yam.[1,2]

Fruits and Nuts: Almond, apple, cherry, grapes, nectarine, peach, pear, pecan, plum, prune, and walnuts.

Ornamental Plants and Forest Trees: Christmas tree plantations, forest trees, ornamental and/or shade trees, pine trees, field-grown ornamental herbaceous plants, field-grown ornamental woody shrubs and vines, and rights-of-way.[1,2]

Non-agriculture Land and Pastures.

The crops included in the post mitigation uses of methyl parathion differ from the above list. The following crops were added: dried beans and dried peas**.** The following crops were taken out: apple, artichoke, broccoli, brussel sprouts, carrots, cauliflower, celery, cherry, collards, forest trees, garden beets, grapes, grasses grown for seed, kale, kohlrabi, lettuce, mustard, nectarine, non-agricultural land (mosquito use), ornamentals, pastures, peach, pears, plums, prunes, rangeland, spinach, succulent beans, succulent peas, tomatoes, and turnips.

Occupational use Products and Homeowner Use Products

At this time, products containing methyl parathion are intended for occupational uses. Methyl parathion is a restricted-use pesticide and is only available for retail sale to and for use by certified applicators (or persons under their direct supervision) and only for those uses covered by the certified applicator's certification.[1] There are no homeowner uses, however, residential exposure could occur via agricultural spray drift from the use of methyl parathion on adjacent fields or from the use of methyl parathion as a mosquito control agent.

Summary of Toxicity Concerns

Acute Toxicology Categories

The toxicological data base for methyl parathion is adequate and will support reregistration. Guideline studies for acute toxicity indicate that the technical grade of methyl parathion classified as category I for acute oral toxicity, category I for acute dermal toxicity, category I for inhalation toxicity, category III for primary eye irritation, and category IV for primary skin irritation. Methyl parathion is not classified as a dermal sensitizer.[3]

Toxicological Endpoints of Concern

The methyl parathion hazard identification committee report, dated March 23, 1999, indicates that there are toxicological endpoints of concern for methyl parathion. Dermal and inhalation endpoints of concern have been identified for short-term and intermediate-term exposure durations. These endpoints are listed in Table 1.

An uncertainty factor (UF) of 100 was applied to account for both interspecies extrapolation (10X) and intraspecies variability (10X). An additional factor of 10X was retained in accordance with the FQPA. This is justified because toxicity studies demonstrate neuropathology at relatively low dose levels and because evidence of developmental neurotoxic potential was seen in open literature studies. Target MOEs are 100 for occupational exposures and 1000 for residential exposures.

Since both the dermal and inhalation NOAELs were based on identical endpoints, the doses were combined in this risk assessment to identify a total MOE for the short and intermediate-term. No chronic exposure scenarios were identified.

Table 1. Methyl Parathion Hazard Endpoints and Uncertainty Factors.

Route / Duration	NOAEL (mg/kg/day)	Effect	Study	Uncertainty Factors	Comments
Dermal (short and intermediate term)	0.11	Neuropathology & inhibition of brain, plasma, & RBC ChE	1-year dietary rat study	Interspecies: 10x Intraspecies: 10x FQPA: 10x (res.)	100 percent dermal absorption
Inhalation (short and intermediate term)	0.11	Neuropathology & inhibition of brain, plasma, & RBC ChE	1-year dietary rat study	Interspecies: 10x Intraspecies: 10x FQPA: 10x (res.)	100 percent inhalation absorption

Epidemiological Information

Incident reports for methyl parathion were extracted from four databases with the following results:

OPP Incident Data System (IDS): Twelve anecdotal or alleged incidents were reported in IDS.

Poison Control Centers(PCC) -- Occupational and Non-occupational Exposure: 274 methyl parathion cases were recorded in the PCC database from 1985 through 1992. Of these, 102 cases resulted from occupational exposure (91 involved exposure to methyl parathion alone) and 146 cases resulted from non-occupational exposure (133 involved exposure to methyl parathion alone). Including exposure to multiple chemicals, methyl parathion had the fifth highest percent of occupational cases seen in a health care facility. On other measures of hazard (percent hospitalized, percent with symptoms or life-threatening symptoms) methyl parathion had results similar to the median for other cholinesterase inhibitors.

From 1993 through 1996 there were 132 exposures reported to Poison Control Centers. Of these 91 occurred in a residential setting and 26 occurred at the workplace. Another 12 cases occurred in a public area and 3 occurred at an unknown location. Children or teenagers were involved in 43 of the exposures. Of the residential cases, 43 received follow-up to determine medical outcome, of which 23 reported minor symptoms, 7 with moderate symptoms, and one case that was classified as life-threatening. Thirty-six of the residential cases were seen in a health care facility, including five that were hospitalized and 2 that were seen in an intensive care unit. Of the occupational cases, 8 had minor symptoms, 3 had moderate outcome. Seventeen of the occupational cases were seen in a health care facility of which two were hospitalized.

Poison Control Centers(PCC) -- California Data for Ratio of Poisoning to Number of Applications: Methyl parathion had very low ratios of handler and field worker poisonings per 1,000 applications in California from 1982 through 1989. Only two pesticides (*Bacillus thuringiensis* and permethrin) had lower ratios.

Poison Control Centers(PCC) -- Ratios of Poisoning based on U.S. Poison Control Data: Among pesticides used exclusively in agriculture, methyl parathion had the third lowest ratio of exposures, poisonings, and treatment to estimated pounds of active ingredient used. It also had the second lowest ratio of hospitalized cases per estimated pounds used.

Poison Control Centers(PCC) -- Exposure in Children: For methyl parathion, 26 incidents were reported in children under five years of age from 1985-1992. No further analyses were conducted.

California Department of Food and Agriculture (1982 through 1995): Methyl parathion ranked 90th as a cause of systemic poisonings in California. It was the sole active ingredient in seven of the 18 reported cases. Workers took from two to five days off work as a result of their illness.

National Pesticide Telecommunications Network (NPTN): Methyl parathion was not reported on the list of the top 200 chemicals involved in human incidents.

OCCUPATIONAL AND RESIDENTIAL EXPOSURE AND RISKS

Chemical-specific data for assessing human exposures during pesticide handling activities were not submitted to the Agency in support of the reregistration of methyl parathion. It is the policy of the HED to use data from the Pesticide Handlers Exposure Database (PHED) Version 1.1 to assess handler exposures for regulatory actions when chemical-specific monitoring data are not available.[4]

PHED was designed by a task force of representatives from the U.S. EPA, Health Canada, the California Department of Pesticide Regulation, and member companies of the American Crop Protection Association. PHED is a software system consisting of two parts -- a database of measured exposure values for workers involved in the handling of pesticides under actual field conditions and a set of computer algorithms used to subset and statistically summarize the selected data. Currently, the database contains values for over 1,700 monitored individuals (i.e., replicates)

Users select criteria to subset the PHED database to reflect the exposure scenario being evaluated. The subsetting algorithms in PHED are based on the central assumption that the magnitude of handler exposures to pesticides are primarily a function of activity (e.g., mixing/loading, applying), formulation type (e.g., wettable powders, granulars), application method (e.g., aerial, groundboom), and clothing scenarios (e.g., gloves, double layer clothing).

Once the data for a given exposure scenario have been selected, the data are normalized (i.e., divided by) by the amount of pesticide handled resulting in standard unit exposures (milligrams of exposure per pound of active ingredient handled). Following normalization, the data are statistically summarized. The distribution of exposure values for each body part (e.g., chest, upper arm) is categorized as normal, lognormal, or "other" (i.e., neither normal nor lognormal). A central tendency value is then selected from the distribution of the exposure values for each body part. These values are the arithmetic mean for normal distributions, the geometric mean for lognormal distributions, and the median for all "other" distributions. Once selected, the central tendency values for each body part are composited into a "best fit" exposure value representing the entire body.

The unit exposure values calculated by PHED generally range from the geometric mean to the median of the selected data set. To add consistency and quality control to the values produced from this system, the PHED Task Force has evaluated all data within the system and has developed a set of grading criteria to characterize the quality of the original study data. The assessment of data quality is based on the number of observations and the available quality control data. While data from PHED provide the best available information on handler exposures, it should be noted that some aspects of the included studies (e.g., duration, acres treated, pounds of active ingredient handled) may not accurately represent labeled uses in all cases. HED has developed a series of tables of standard unit exposure values for many occupational scenarios that can be utilized to ensure consistency in exposure assessments.[5]

Handler Exposures & Assumptions

HED has determined that there are potential exposures to mixers, loaders, applicators, and other handlers during usual use-patterns associated with methyl parathion. Based on the use patterns of methyl parathion, twelve major exposure scenarios were identified: (1a) mixing/loading liquids (emulsifiable concentrate) for aerial application; (1b) mixing/loading liquids (emulsifiable concentrate) for groundboom application; (2a) mixing/loading liquids (microencapsulated) for aerial/chemigation application; (2b) mixing/loading liquids (microencapsulated) for groundboom application; (2c) mixing/loading liquids (microencapsulated) for airblast application; (3) applying sprays with aerial equipment (emulsifiable concentrate); (4) applying sprays with aerial equipment (microencapsulated); (5) applying sprays with groundboom equipment (emulsifiable concentrate); (6) applying sprays with groundboom equipment (microencapsulated); (7) applying sprays with airblast sprayer (microencapsulated); (8) flagging sprays (emulsifiable concentrate); and (9) flagging sprays (microencapsulated).

Short-term and intermediate-term exposures and doses at baseline for the pre mitigation use patterns (developed using PHED Version 1.1 surrogate data) are presented in Table 2. The short- and intermediate term MOEs with mitigation methods for pre mitigation use patterns are presented in Table 3. Table 4 discusses the short-term and intermediate-term exposures and doses at baseline for post mitigation uses of methyl parathion. Table 5 discusses the short- and intermediate term MOEs with mitigation methods for post mitigation uses to methyl parathion. Table 6 summarizes the caveats and parameters specific to each exposure scenario and corresponding risk assessment The short and intermediate term MOEs are identical since they have the same endpoint.

The following general assumptions are made:

- Average body weight of an adult handler is 70 kg.

- Average work day interval represents an 8 hour workday (e.g., the acres treated or volume of spray solution prepared in a typical day).

- Calculations of the handler scenarios for the pre mitigation uses and the post mitigation uses both take into account the application rates proposed by one of the registrants. The various crop groupings found in the application rate column of the tables (i.e., cotton, rice, etc.) are assigned in a way to try to simplify the exposure assessments for this chemical. The crop groupings are developed based on different ranges of application rates.

- PHED Version 1.1 data were used for to estimate exposures for all scenarios.[5]

- Due to a lack of scenario-specific data, HED calculated unit exposure values using generic data from the Pesticide Handler Exposure Database (PHED) and, in lieu of PHED data for a scenario, using protection factors that are applied to represent various risk mitigation options (i.e., the use of personal protective equipment (PPE) and engineering controls). See Table 4 for detailed descriptions.

- Area treated in each scenario: 350 acres for aerial and chemigation applications (including flaggers supporting aerial applications); 80 acres for groundboom applications; and 40 acres for airblast application.

- The labels indicate that a ground or aerial sprayer can be used for field-grown ornamentals. Exposure and risk assessments for handheld equipment were not conducted. Ornamental use is not included in the post mitigation uses.

- No PHED data were available for microencapsulant formulations; therefore, PHED data for liquids was used as a surrogate for this formulation.

Potential daily dermal exposure is calculated using the following formula:

$$\text{Daily Dermal Exposure}\left(\frac{\text{mg ai}}{\text{day}}\right) = \text{Unit Exposure}\left(\frac{\text{mg ai}}{\text{lb ai}}\right) \times \text{Use Rate}\left(\frac{\text{lb ai}}{\text{A}}\right) \times \text{Daily Acres Treated}\left(\frac{\text{A}}{\text{day}}\right)$$

Potential daily inhalation exposure is calculated using the following formula:

$$\text{Daily Inhalation Exposure}\left(\frac{\text{mg ai}}{\text{day}}\right) =$$
$$\text{Unit Exposure}\left(\frac{\mu\text{g ai}}{\text{lb ai}}\right) \times \text{Conversion Factor}\left(\frac{1\text{mg}}{1{,}000\ \mu\text{g}}\right) \times \text{Use Rate}\left(\frac{\text{lb ai}}{\text{A}}\right) \times \text{Daily Acres Treated}\left(\frac{\text{A}}{\text{day}}\right)$$

Dermal and inhalation absorption is assumed to be 100 percent. The daily dermal and inhalation dose is calculated using a 70 kg body weight for both short-term and intermediate-term exposure as follows:

$$\text{Daily Inhalation Dose}\left(\frac{\text{mg ai}}{\text{kg/day}}\right) = \text{Daily Inhalation Exposure}\left(\frac{\text{mg ai}}{\text{day}}\right) \times \left(\frac{1}{\text{Body Weight (kg)}}\right)$$

$$\text{Daily Dermal Dose}\left(\frac{\text{mg ai}}{\text{Kg/Day}}\right) = \text{Daily Dermal Exposure}\left(\frac{\text{mg ai}}{\text{Day}}\right) \times \left(\frac{1}{\text{Body Weight (Kg)}}\right)$$

$$\text{Total Daily Dose} = \text{Daily Dermal Dose}\left(\frac{\text{mg}}{\text{kg/day}}\right) + \text{Daily Inhalation Dose}\left(\frac{\text{mg}}{\text{kg/day}}\right)$$

These calculations of both the daily dermal dose and the daily inhalation dose of methyl parathion received by handlers are used to assess the total risk to handlers. The short-term and intermediate-term total MOEs were calculated using a NOAEL of 0.11 mg/kg/day. The following formula describes the calculation of a total MOE:

$$\text{Total MOE} = \frac{\text{NOEL}\left(\frac{\text{mg}}{\text{kg/day}}\right)}{\text{Total Daily Dose}\left(\frac{\text{mg}}{\text{kg/day}}\right)}$$

Table 2. Occupational Short-Term and Intermediate-Term Dermal and Inhalation Exposure to Methyl Parathion and Doses at Baseline for the Pre Mitigation Uses of Methyl Parathion.

Exposure Scenario (Scenario #)	Baseline Dermal Unit Exposure (mg/lb ai)[a]	Baseline Inhalation Unit Exposure (μg/lb ai)[b]	Maximum Application Rate (lb ai/acre)[c]	Crop[d]	Daily Acres Treated[e]	Daily Dermal Exposure (mg/day)[f]	Daily Inhalation Exposure (mg/day)[g]	Baseline Dermal Dose (mg/kg/day)[h]	Baseline Inhalation Dose (mg/kg/day)[i]	Baseline Total Dose (mg/kg/day)[j]	Total Short and Int-term MOE[k]
Mixer/Loader Exposure											
Mixing/Loading Liquids (emulsifiable concentrate) for Aerial Application (1a)	2.9	1.2	0.375	sugar beets	350	380	0.16	5.4	0.0023	5.4	0.020
			1.5	broccoli		1500	0.63	22	0.0090	22	0.0051
			3.0	cotton		3000	1.3	44	0.018	44	0.0025
Mixing/Loading Liquids (emulsifiable concentrate) for Groundboom Application (1b)			0.375	sugar beets	80	87	0.036	1.2	0.00051	1.2	0.088
			1.5	broccoli		350	0.14	5.0	0.0021	5.0	0.022
			3.0	cotton		670	0.29	9.9	0.0041	9.9	0.011
Mixing/Loading Liquids (microencapsulated) for Aerial/Chemigation Application (2a)	2.9	1.2	0.5	peas	350	510	0.21	7.3	0.003	7.3	0.015
			1.5	cherries		1500	0.63	22	0.0090	22	0.0051
			2.0	pears		2000	0.84	29	0.012	29	0.0038
			3.0 (L)	grapes		3000	1.3	44	0.018	44	0.0025
Mixing/Loading Liquids (microencapsulated) for Groundboom Application (2b)			0.5	peas	80	120	0.048	1.7	0.00069	1.7	0.066
			1.0	corn		230	0.096	3.3	0.0014	3.3	0.033
			1.5	potatoes		350	0.14	5.0	0.0021	5.0	0.022
			3.0 (L)	grapes		700	0.29	9.9	0.0041	9.9	0.011
Mixing/Loading Liquids (microencapsulated) for Airblast Sprayer (2c)			1.5	cherries	40	170	0.072	2.5	0.0010	2.5	0.044
			2.0	pears		230	0.096	3.3	0.0014	3.3	0.033
			3.0 (L)	grapes		350	0.14	5.0	0.0021	5.0	0.022

Exposure Scenario (Scenario #)	Baseline Dermal Unit Exposure (mg/lb ai)[a]	Baseline Inhalation Unit Exposure (μg/lb ai)[b]	Maximum Application Rate (lb ai/acre)[c]	Crop[d]	Daily Acres Treated[e]	Daily Dermal Exposure (mg/day)[f]	Daily Inhalation Exposure (mg/day)[g]	Baseline Dermal Dose (mg/kg/day)[h]	Baseline Inhalation Dose (mg/kg/day)[i]	Baseline Total Dose (mg/kg/day)[j]	Total Short and Int-term MOE[k]
Applicator Exposure											
Applying Liquids with Aerial Equipment (emulsifiable concentrate) (3)	See Eng. Controls	See Eng. Controls	0.375	sugar beets	350	See Eng. Controls	See Eng. Controls	See Eng. Controls	See Eng. Controls	See Eng. Controls	See Eng. Controls
			1.5	broccoli							
			3.0	cotton							
Applying Liquids with Aerial Equipment (microencapsulated) (4)	See Eng. Controls	See Eng. Controls	0.5	peas	350	See Eng. Controls	See Eng. Controls	See Eng. Controls	See Eng. Controls	See Eng. Controls	See Eng. Controls
			1.5	cherries							
			2.0	pears							
			3.0 (L)	grapes							
Applying Liquids with a Groundboom Sprayer (emulsifiable concentrate) (5)	0.014	0.74	0.375	sugar beets	80	0.42	0.022	0.00060	0.00032	0.0063	17
			1.5	broccoli		1.7	0.089	0.024	0.0013	0.025	4.4
			3.0	cotton		3.4	0.18	0.048	0.0025	0.051	2.2
Applying Liquids with a Groundboom Sprayer (microencapsulated) (6)	0.014	0.74	0.5	potatoes	80	0.56	0.030	0.0080	0.00042	0.0084	13
			1.0	corn		1.1	0.059	0.016	0.00085	0.017	6.5
			1.5	potatoes		1.7	0.089	0.024	0.0013	0.025	4.4
			3.0 (L)	grapes		3.4	0.18	0.048	0.0025	0.051	2.2
Applying Sprays with an Airblast Sprayer (microencapsulated) (7)	0.36	4.5	1.5	cherries	40	22	0.27	0.31	0.0039	0.31	0.35
			2.0	pears		29	0.36	0.41	0.0051	0.42	0.26
			3.0 (L)	grapes		43	0.54	0.62	0.0077	0.62	0.18

Exposure Scenario (Scenario #)	Baseline Dermal Unit Exposure (mg/lb ai)[a]	Baseline Inhalation Unit Exposure (μg/lb ai)[b]	Maximum Application Rate (lb ai/acre)[c]	Crop[d]	Daily Acres Treated[e]	Daily Dermal Exposure (mg/day)[f]	Daily Inhalation Exposure (mg/day)[g]	Baseline Dermal Dose (mg/kg/day)[h]	Baseline Inhalation Dose (mg/kg/day)[i]	Baseline Total Dose (mg/kg/day)[j]	Total Short and Int-term MOE[k]
Flagger Exposures											
Flagging Aerial Spray Applications (emulsifiable concentrate) (8)	0.011	0.35	0.375	sugar beets	350	1.4	0.046	0.021	0.00066	0.021	5.2
			1.5	broccoli		5.8	0.18	0.083	0.0026	0.085	1.3
			3.0	cotton		12	0.37	0.17	0.0053	0.17	0.65
Flagging Aerial Spray Applications (microencapsulated) (9)	0.011	0.35	0.5	peas		1.9	0.061	0.028	0.00088	0.028	3.9
			1.5	cherries		5.8	0.18	0.083	0.0026	0.085	1.3
			2.0	pears		7.7	0.25	0.11	0.0035	0.11	0.97
			3.0 (L)	grapes		12	0.37	0.17	0.0053	0.17	0.65

Footnotes

a Baseline dermal unit exposure represents long pants, long sleeved shirt, no gloves, open mixing/loading, open cab tractor. Baseline data are not available for aerial equipment.

b Baseline inhalation exposure represents no respirator.

c Application rates are a range of maximum application rates proposed by the registrant and on the labels. If rates are not equal, they are designated with a R for registrant proposed or a L for label.

d **Emulsifiable concentrate formulation**

Crop listed (max. app. rate (lbs ai/acre))	Also represents (max. app. rate (lbs ai/acre))
sugar beets (0.375)	canola (0.5 R, 0.25 L), soybeans (0.5 R, 1.0 L), grass and turnips (0.75)
broccoli (1.5)	alfalfa (1 R, 1.25 L), onions (1 R, 0.78 L), rice (0.75), corn (1 R, 0.5 L). soybeans (0.5R, 1.0L), artichoke, carrots, celery, hops,ornamentals, lettuce, sunflowers, spinach, and peas (1). barley, oats, wheat and rye (1.25 R, 0.75 L). cauliflower, brussel sprouts, cabbage, dried beans, kale, collards, mustard greens, green beans, and potatoes (1.5)
cotton (3)	none

Microencapsulate formulation

Crop listed (max. app. rate (lbs ai/acre))	Also represents (max. app. rate (lbs ai/acre))
peas (0.5) (aerial and groundboom)	onions (1 R, 0.5 L), lentils (0.5), barley, oats, grass, rye, yams, rice, sweet potatoes, and wheat (0.75)
cherries (1.5) (aerial)	alfalfa, corn, dried beans, green beans, peanuts, soybeans, and tomatoes (1). cotton (1.0R, 1.5L), potatoes (1.5), plums (1.5 R, 2L). grapes (1.5 R).
pears (2) (aerial and airblast)	almonds, nectarines, pecans, walnuts, apples and peaches (2)
corn (1) (groundboom)	alfalfa, corn, dried beans, green beans, peanuts, soybeans, and tomatoes (1).
potatoes (1.5) (groundboom)	cotton (1.0R, 1.5L), potatoes (1.5). grapes (1.5R)

cherries (1.5) (airblast)	plums (1.5 R, 2.0 L) and grapes (1.5R)
grapes (L) (3.0) (airblast and groundboom)	none

e Daily acres treated values are from the EPA HED estimates of acreage that could be treated in a single day for each exposure scenario of concern.

f Daily dermal exposure (mg/day) = Dermal Unit Exposure (mg/lb ai) * Application rate (lb ai/acre) * Acres treated (acres/day).

g Daily inhalation exposure (mg/day) = Inhalation Unit Exposure (µg/lb ai) * (1mg/1000 µg) Conversion factor * Application rate (lb ai/A) * Acres treated (acres/day).

h Baseline dermal dose (mg/kg/day) = Daily dermal exposure / Body weight (70 kg).

i Baseline inhalation dose (mg/kg/day) = Daily inhalation exposure / Body weight (70 kg).

j Total Dose(mg/kg/day) = Inhalation dose (mg/kg/day) + dermal dose (mg/kg/day).

k Total Short and Intermediate Term MOE = Short and intermediate term NOAEL (0.11 mg/kg/day)/baseline total dose (mg/kg/day).

Table 3. Occupational Short and Intermediate Term Combined Inhalation and Dermal MOEs for Methyl Parathion with Mitigation Measures for Occupational Exposures for the Pre Mitigation Uses of Methyl Parathion.

Exposure Scenario (Scenario #)	Crop	Additional Mitigation Measures										
		Additional PPE					Engineering Controls					
		Unit Dermal Exposure[a] (mg/lb ai)	Daily Dermal Dose[b] (mg/kg/day)	Daily Inhalation Dose[c] (mg/kg/day)	Total Dose[d]	Total MOE[e]	Unit Dermal Exposure[f] (mg/lb ai)	Daily Dermal Dose[b] (mg/kg/day)	Unit Inhalation Exposure[f] (μg/lb ai)	Daily Inhalation Dose[h] (mg/kg/day)	Total Dose[d]	Total MOE[e]
Mixer/Loader Exposure and Dose Levels												
Mixing/Loading Liquids (emulsifiable concentrate) for Aerial Application (1a)	sugar beets	0.017	0.032	0.00045	0.032	3.4	0.0086 (gloves)	0.016	0.083	0.00016	0.016	6.8
	broccoli		0.13	0.0018	0.13	0.85		0.065		0.00062	0.065	1.7
	cotton		0.26	0.0036	0.26	0.43		0.13		0.0013	0.13	0.84
Mixing/Loading Liquids (emulsifiable concentrate) for Groundboom Application (1b)	sugar beets		0.0073	0.00010	0.0074	15		0.0037		0.000036	0.0037	30
	broccoli		0.029	0.00041	0.030	3.7		0.015		0.00014	0.015	7.4
	cotton		0.058	0.00082	0.059	1.9		0.029		0.00028	0.030	3.7
Mixing/Loading Liquids (microencapsulated) for Aerial/Chemigation Application (2a)	peas	0.017	0.043	0.00060	0.043	2.6	0.0086 (gloves)	0.022	0.83	0.00021	0.022	5.1
	cherries		0.013	0.0018	0.13	0.85		0.064		0.00062	0.065	1.7
	pears		0.17	0.0024	0.17	0.64		0.086		0.00083	0.087	1.3
	grapes		0.26	0.0036	0.26	0.43		0.13		0.0013	0.13	0.84
Mixing/Loading Liquids (microencapsulated) for Groundboom Application (2b)	peas		0.0097	0.00014	0.0099	11		0.0049		0.000047	0.0050	22
	corn		0.019	0.00027	0.020	5.6		0.0098		0.000095	0.0099	11
	potatoes		0.029	0.00041	0.030	3.7		0.015		0.00014	0.015	7.4
	grapes		0.059	0.00082	0.059	1.9		0.029		0.00028	0.030	3.7
Mixing/Loading Liquids (microencapsulated) for Airblast Sprayer (2c)	cherries		0.015	0.00027	0.015	7.4		0.0074		0.000071	0.0074	15
	pears		0.019	0.00027	0.020	5.6		0.0098		0.000095	0.0099	11
	grapes		0.029	0.00041	0.030	3.7		0.015		0.00014	0.015	7.4

Exposure Scenario (Scenario #)	Crop	Additional Mitigation Measures										
		Additional PPE					Engineering Controls					
		Unit Dermal Exposure[a] (mg/lb ai)	Daily Dermal Dose[b] (mg/kg/day)	Daily Inhalation Dose[c] (mg/kg/day)	Total Dose[d]	Total MOE[e]	Unit Dermal Exposure[f] (mg/lb ai)	Daily Dermal Dose[b] (mg/kg/day)	Unit Inhalation Exposure[f] (μg/lb ai)	Daily Inhalation Dose[h] (mg/kg/day)	Total Dose[d]	Total MOE[e]
Applicator Exposure, Dose, and Risk Levels												
Applying Liquids with Aerial Equipment (emulsifiable concentrate) (3)	sugar beets	See Eng. Controls	See Eng. Controls	See Eng. Controls	See Eng. Controls	See Eng. Controls	0.005	0.0094	0.068	0.00013	0.0095	12
	broccoli							0.038		0.00051	0.038	2.9
	cotton							0.075		0.0010	0.076	1.4
Applying Liquids with Aerial Equipment (microencapsulated) (4)	peas	See Eng. Controls	See Eng. Controls	See Eng. Controls	See Eng. Controls	See Eng. Controls	0.005	0.013	0.068	0.00017	0.013	8.7
	cherries							0.038		0.00051	0.038	3.0
	pears							0.05		0.00068	0.051	2.2
	grapes							0.075		0.0010	0.076	1.4
Applying Liquids with a Groundboom Sprayer (emulsifiable concentrate) (5)	sugar beets	0.011	0.0047	0.00006	0.0048	23	0.005	0.0021	0.043	0.000018	0.0022	51
	broccoli		0.019	0.00025	0.019	5.8		0.0086		0.000074	0.0086	13
	cotton		0.038	0.00051	0.038	2.9		0.017		0.00015	0.017	6.4
Applying Liquids with a Groundboom Sprayer (microencapsulated) (6)	potatoes		0.0063	0.00008	0.0064	17		0.0029		0.000025	0.0029	38
	corn		0.0013	0.00017	0.013	8		0.0057		0.000049	0.0058	19
	potatoes		0.019	0.00025	0.019	5.8		0.0086		0.000074	0.0086	13
	grapes		0.038	0.00051	0.038	2.9		0.017		0.00015	0.017	6.4
Applying Liquids Using an Airblast Sprayer (microencapsulated) (7)	cherries	0.22	0.19	0.00077	0.20	0.58	0.019 (gloves)	0.016	0.45	0.00039	0.017	6.6
	pears		0.25	0.0010	0.25	0.44		0.022		0.00051	0.022	4.9
	grapes		0.38	0.0015	0.38	0.29		0.033		0.00077	0.033	3.3

Exposure Scenario (Scenario #)	Crop	Additional Mitigation Measures										
		Additional PPE					Engineering Controls					
		Unit Dermal Exposure[a] (mg/lb ai)	Daily Dermal Dose[b] (mg/kg/day)	Daily Inhalation Dose[c] (mg/kg/day)	Total Dose[d]	Total MOE[e]	Unit Dermal Exposure[f] (mg/lb ai)	Daily Dermal Dose[b] (mg/kg/day)	Unit Inhalation Exposure[f] (μg/lb ai)	Daily Inhalation Dose[h] (mg/kg/day)	Total Dose[d]	Total MOE[e]
Flagger Exposure												
Flagging Aerial Spray Applications (emulsifiable concentrate) (8)	sugar beets	0.010	0.019	0.00013	0.019	5.8	0.00022	0.00041	0.007	0.000013	0.00043	260
	broccoli		0.075	0.00053	0.076	1.5		0.0017		0.000053	0.0017	65
	cotton		0.15	0.0011	0.15	0.73		0.0033		0.00011	0.0034	32
Flagging Aerial Spray Applications (microencapsulated) (9)	peas		0.025	0.00018	0.025	4.4		0.00055		0.000018	0.00057	190
	cherries		0.075	0.00053	0.076	1.5		0.0017		0.000053	0.0017	65
	pears		0.10	0.00070	0.10	1.1		0.0022		0.000070	0.0023	48
	grapes		0.15	0.0011	0.15	0.73		0.0033		0.00011	0.0034	32

Footnotes

a Additional PPE for all dermal scenarios includes double layer of clothing (50% Protection Factor for clothing) and chemical resistant gloves.

b Daily Dermal Dose (mg/kg/day) = ((Dermal Unit Exposure (mg/lb ai) x Application Rates (lb ai/A and lb ai/sq. ft.) x Area Treated per day (acres)) / Body Weight (70 kg))

c Daily Inhalation Dose (Baseline Inhalation Dose)/ 5) [Additional PPE for all inhalation scenarios includes a dust/mist respirator for a 5-fold Protection Factor].

d Total Dose (mg/kg/day) = Inhalation dose (mg/kg/day) + Dermal Dose (mg/kg/day).

e Total MOE = Short and Intermediate term MOE (0.11 mg/kg/day) / total dose (mg/kg/day).

f

Scenario Number	Engineering Controls
1a / 1b / 1c / 2a / 2b / 2c	Closed mixing / loading, single layer clothing, chemical resistant gloves.
3, 4, 5, 6, 7	Enclosed cab, single layer clothing, no gloves.
8, 9	Enclosed truck (98% Protection Factor), single layer clothing, no gloves.

h Daily Inhalation Dose (mg/kg/day) = ((Inhalation Unit Exposure (mg/lb ai) * Application Rates (lb ai/A) * Area Treated per day (acres)) / Body Weight (70 kg))

Table 4. Occupational Short-Term and Intermediate-Term Dermal and Inhalation Exposure to Methyl Parathion and Doses at Baseline for Post Mitigation Uses.

Exposure Scenario (Scenario #)	Baseline Dermal Unit Exposure (mg/lb ai)[a]	Baseline Inhalation Unit Exposure (μg/lb ai)[b]	Maximum Application Rate (lb ai/acre)[c]	Crop[d]	Daily Acres Treated[e]	Daily Dermal Exposure (mg/day)[f]	Daily Inhalation Exposure (mg/day)[g]	Baseline Dermal Dose (mg/kg/day)[h]	Baseline Inhalation Dose (mg/kg/day)[i]	Baseline Total Dose (mg/kg/day)[j]	Total Short and Int-term MOE[k]
Mixer/Loader Exposure											
Mixing/Loading Liquids (emulsifiable concentrate) for Aerial Application (1a)	2.9	1.2	0.375	sugar beets	350	380	0.16	5.4	0.0023	5.4	0.020
			1.5	cabbage		1500	0.63	22	0.0090	22	0.0051
			3.0	cotton		3000	1.3	44	0.018	44	0.0025
Mixing/Loading Liquids (emulsifiable concentrate) for Groundboom Application (1b)			0.375	sugar beets	80	87	0.036	1.2	0.00051	1.2	0.088
			1.5	cabbage		350	0.14	5.0	0.0021	5.0	0.022
			3.0	cotton		700	0.29	9.9	0.0041	9.9	0.011
Mixing/Loading Liquids (microencapsulated) for Aerial/Chemigation Application (2a)	2.9	1.2	0.5	peas	350	510	0.21	7.3	0.003	7.3	0.015
			1.0	alfalfa		1000	0.42	15	0.006	15	0.0076
			1.5	potatoes		1500	0.63	22	0.0090	22	0.0051
			2.0	pecans		2000	0.84	29	0.012	29	0.0038
Mixing/Loading Liquids (microencapsulated) for Groundboom Application (2b)			0.5	peas	80	120	0.048	1.7	0.00069	1.7	0.066
			1.0	alfalfa		230	0.096	3.3	0.0014	3.3	0.033
			1.5	potatoes		350	0.14	5.0	0.0021	5.0	0.022
Mixing/Loading Liquids (microencapsulated) for Airblast Sprayer (2c)			2.0	pecans	40	230	0.01	3.3	0.0014	3.3	0.033

Exposure Scenario (Scenario #)	Baseline Dermal Unit Exposure (mg/lb ai)[a]	Baseline Inhalation Unit Exposure (μg/lb ai)[b]	Maximum Application Rate (lb ai/acre)[c]	Crop[d]	Daily Acres Treated[e]	Daily Dermal Exposure (mg/day)[f]	Daily Inhalation Exposure (mg/day)[g]	Baseline Dermal Dose (mg/kg/day)[h]	Baseline Inhalation Dose (mg/kg/day)[i]	Baseline Total Dose (mg/kg/day)[j]	Total Short and Int-term MOE[k]
Applicator Exposure											
Applying Liquids with Aerial Equipment (emulsifiable concentrate) (3)	See Eng. Controls	See Eng. Controls	0.375	sugar beets	350	See Eng. Controls	See Eng. Controls	See Eng. Controls	See Eng. Controls	See Eng. Controls	See Eng. Controls
			1.5	cabbage							
			3.0	cotton							
Applying Liquids with Aerial Equipment (microencapsulated) (4)	See Eng. Controls	See Eng. Controls	0.5	peas	350	See Eng. Controls	See Eng. Controls	See Eng. Controls	See Eng. Controls	See Eng. Controls	See Eng. Controls
			1.0	alfalfa							
			1.5	potatoes							
			2.0	pecans							
Applying Liquids with a Groundboom Sprayer (emulsifiable concentrate) (5)	0.014	0.74	0.375	sugar beets	80	0.42	0.022	0.00060	0.00032	0.0063	17
			1.5	cabbage		1.7	0.089	0.024	0.0013	0.025	4.4
			3.0	cotton		3.4	0.18	0.048	0.0025	0.051	2.2
Applying Liquids with a Groundboom Sprayer (microencapsulated) (6)	0.014	0.74	0.5	peas	80	0.56	0.030	0.0080	0.00042	0.0084	13
			1.0	alfalfa		1.1	0.059	0.016	0.00085	0.017	6.5
			1.5	potatoes		1.7	0.089	0.024	0.0013	0.025	4.4
Applying Sprays with an Airblast Sprayer (microencapsulated) (7)	0.36	4.5	2.0	pecans	40	29	0.36	0.41	0.0051	0.42	0.26
Flagger Exposures											
Flagging Aerial Spray Applications (emulsifiable concentrate) (8)	0.011	0.35	0.375	sugar beets	350	1.4	0.046	0.021	0.00066	0.021	5.2
			1.5	cabbage		5.8	0.18	0.083	0.0026	0.085	1.3
			3.0	cotton		12	0.37	0.17	0.0053	0.17	0.65
Flagging Aerial Spray Applications (microencapsulated) (9)	0.011	0.35	0.5	peas		1.9	0.061	0.028	0.00088	0.028	3.9
			1.0	alfalfa		3.9	0.12	0.055	0.0018	0.057	1.9
			1.5	potatoes		5.8	0.18	0.083	0.0026	0.085	1.3
			2.0	pecans		7.7	0.25	0.11	0.0035	0.11	0.97

Footnotes

a Baseline dermal unit exposure represents long pants, long sleeved shirt, no gloves, open mixing/loading, open cab tractor. Baseline data are not available for aerial equipment.

b Baseline inhalation exposure represents no respirator.

c Application rates are a range of maximum application rates proposed by the registrant and on the labels. If rates are not equal, they are designated with a R for registrant proposed or a L for label.

d **Emulsifiable concentrate formulation**

Crop listed (max. app. rate (lbs ai/acre))	Also represents (max. app. rate (lbs ai/acre))
sugar beets (0.375)	Rape seed (0.5 R, 0.25 L), soybeans (0.5 R, 1.0 L), sweet potato and grass (0.75)
cabbage (1.5)	alfalfa (1 R, 1.25 L), onions (1 R, 0.78 L), rice (0.75), corn (1 R, 0.5 L). hops and dried peas (1). barley, oats, wheat and rye (1.25 R, 0.75 L). dried beans and white potatoes (1.5)
cotton (3)	none

Microencapsulate formulation

Crop listed (max. app. rate (lbs ai/acre))	Also represents (max. app. rate (lbs ai/acre))
peas (0.5) (aerial and groundboom)	onions (1 R, 0.5 L). lentils and dried peas (0.5). barley, oats, grass, rice, sweet potatoes, and wheat (0.75)
alfalfa (1) (aerial and groundboom)	alfalfa, corn, dried beans, peanuts, and soybeans (1).
Potatoes (1.5) (aerial and groundboom)	cotton (1.0R, 1.5L). white potatoes (1.5).
pecans (2) (aerial and airblast)	almonds and walnuts (2)

e Daily acres treated values are from the EPA HED estimates of acreage that could be treated in a single day for each exposure scenario of concern.

f Daily dermal exposure (mg/day) = Dermal Unit Exposure (mg/lb ai) * Application rate (lb ai/acre) * Acres treated (acres/day).

g Daily inhalation exposure (mg/day) = Inhalation Unit Exposure (µg/lb ai) * (1mg/1000 µg) Conversion factor * Application rate (lb ai/A) * Acres treated (acres/day).

h Baseline dermal dose (mg/kg/day) = Daily dermal exposure / Body weight (70 kg).

i Baseline inhalation dose (mg/kg/day) = Daily inhalation exposure / Body weight (70 kg).

j Total Dose(mg/kg/day) = Inhalation dose (mg/kg/day) + dermal dose (mg/kg/day).

k Total Short and Intermediate Term MOE = Short and intermediate term NOAEL (0.11 mg/kg/day)/baseline total dose (mg/kg/day).

Table 5. Occupational Short and Intermediate Term Combined Inhalation and Dermal MOEs for Methyl Parathion with Mitigation Measures for Occupational Exposures for Post Mitigation Uses.

Exposure Scenario (Scenario #)	Crop	Additional Mitigation Measures										
		Additional PPE					Engineering Controls					
		Unit Dermal Exposure[a] (mg/lb ai)	Daily Dermal Dose[b] (mg/kg/day)	Daily Inhalation Dose[c] (mg/kg/day)	Total Dose[d]	Total MOE[e]	Unit Dermal Exposure[f] (mg/lb ai)	Daily Dermal Dose[b] (mg/kg/day)	Unit Inhalation Exposure[f] (μg/lb ai)	Daily Inhalation Dose[h] (mg/kg/day)	Total Dose[d]	Total MOE[e]
Mixer/Loader Exposure and Dose Levels												
Mixing/Loading Liquids (emulsifiable concentrate) for Aerial Application (1a)	sugar beets	0.017	0.032	0.00045	0.032	3.4	0.0086 (gloves)	0.016	0.083	0.00016	0.016	6.8
	cabbage		0.13	0.0018	0.13	0.85		0.065		0.00062	0.065	1.7
	cotton		0.26	0.0036	0.26	0.43		0.13		0.0013	0.13	0.84
Mixing/Loading Liquids (emulsifiable concentrate) for Groundboom Application (1b)	sugar beets		0.0073	0.00010	0.0074	15		0.0037		0.000036	0.0037	30
	cabbage		0.029	0.00041	0.030	3.7		0.015		0.00014	0.015	7.4
	cotton		0.058	0.00082	0.059	1.9		0.029		0.00028	0.030	3.7
Mixing/Loading Liquids (microencapsulated) for Aerial/Chemigation Application (2a)	peas	0.017	0.043	0.00060	0.043	2.6	0.0086 (gloves)	0.022	0.83	0.00021	0.022	5.1
	alfalfa		0.085	0.0012	0.086	1.3		0.043		0.00042	0.043	2.5
	potatoes		0.013	0.0018	0.13	0.85		0.064		0.00062	0.065	1.7
	pecans		0.17	0.0024	0.17	0.64		0.086		0.00083	0.087	1.3
Mixing/Loading Liquids (microencapsulated) for Groundboom Application (2b)	peas		0.0097	0.00014	0.0099	11		0.0049		0.000047	0.0050	22
	alfalfa		0.019	0.00027	0.020	5.6		0.0098		0.000095	0.0099	11
	potatoes		0.029	0.00041	0.030	3.7		0.015		0.00014	0.015	7.4
Mixing/Loading Liquids (microencapsulated) for Airblast Sprayer (2c)	pecans		0.019	0.00027	0.020	5.6		0.0098		0.000095	0.0099	11
Applicator Exposure, Dose, and Risk Levels												
Applying Liquids with Aerial Equipment (emulsifiable concentrate) (3)	sugar beets	See Eng. Controls	See Eng. Controls	See Eng. Controls	See Eng. Controls	See Eng. Controls	0.005	0.0094	0.068	0.00013	0.0095	12
	cabbage							0.038		0.00051	0.038	2.9
	cotton							0.075		0.0010	0.076	1.4
Applying Liquids with Aerial Equipment (microencapsulated) (4)	peas	See Eng. Controls	See Eng. Controls	See Eng. Controls	See Eng. Controls	See Eng. Controls	0.005	0.013	0.068	0.00017	0.013	8.7
	alfalfa							0.025		0.00034	0.025	4.3
	potatoes							0.038		0.00051	0.038	3.0
	pecans							0.05		0.00068	0.051	2.2

Exposure Scenario (Scenario #)	Crop	Additional Mitigation Measures										
		Additional PPE					Engineering Controls					
		Unit Dermal Exposure[a] (mg/lb ai)	Daily Dermal Dose[b] (mg/kg/day)	Daily Inhalation Dose[c] (mg/kg/day)	Total Dose[d]	Total MOE[e]	Unit Dermal Exposure[f] (mg/lb ai)	Daily Dermal Dose[b] (mg/kg/day)	Unit Inhalation Exposure[f] (μg/lb ai)	Daily Inhalation Dose[h] (mg/kg/day)	Total Dose[d]	Total MOE[e]
Applying Liquids with a Groundboom Sprayer (emulsifiable concentrate) (5)	sugar beets	0.011	0.0047	0.00006	0.0048	23	0.005	0.0021	0.043	0.000018	0.0022	51
	cabbage		0.019	0.00025	0.019	5.8		0.0086		0.000074	0.0086	13
	cotton		0.038	0.00051	0.038	2.9		0.017		0.00015	0.017	6.4
Applying Liquids with a Groundboom Sprayer (microencapsulated) (6)	peas		0.0063	0.00008	0.0064	17		0.0029		0.000025	0.0029	38
	alfalfa		0.0013	0.00017	0.013	8		0.0057		0.000049	0.0058	19
	potatoes		0.019	0.00025	0.019	5.8		0.0086		0.000074	0.0086	13
Applying Liquids Using an Airblast Sprayer (microencapsulated) (7)	pecans	0.22	0.25	0.0010	0.25	0.43	0.019 (gloves)	0.022	0.45	0.00051	0.022	5.0
Flagger Exposure												
Flagging Aerial Spray Applications (emulsifiable concentrate) (8)	sugar beets	0.010	0.019	0.00013	0.019	5.8	0.00022	0.00041	0.007	0.000013	0.00043	260
	cabbage		0.075	0.00053	0.076	1.5		0.0017		0.000053	0.0017	65
	cotton		0.15	0.0011	0.15	0.73		0.0033		0.00011	0.0034	32
Flagging Aerial Spray Applications (microencapsulated) (9)	peas		0.025	0.00018	0.025	4.4		0.00055		0.000018	0.00057	190
	alfalfa		0.05	0.00035	0.05	2.2		0.0011		0.000035	0.0011	97
	potatoes		0.075	0.00053	0.076	1.5		0.0017		0.000053	0.0017	65
	pecans		0.10	0.00070	0.10	1.1		0.0022		0.000070	0.0023	48

Footnotes

a Additional PPE for all dermal scenarios includes double layer of clothing (50% Protection Factor for clothing) & chem. resistant gloves

b Daily Dermal Dose (mg/kg/day) = ((Dermal Unit Exposure (mg/lb ai) x Application Rates (lb ai/A and lb ai/sq. ft.) x Area Treated per day (acres)) / Body Weight (70 kg))

c Daily Inhalation Dose (Baseline Inhalation Dose)/ 5) [Additional PPE for all inhalation scenarios includes a dust/mist respirator for a 5-fold Protection Factor].

d Total Dose (mg/kg/day) = Inhalation dose (mg/kg/day) + Dermal Dose (mg/kg/day).

e Total MOE = Short and Intermediate term MOE (0.11 mg/kg/day) / total dose (mg/kg/day).

f Scenario Number — Engineering Controls

1a / 1b / 1c / 2a / 2b / 2c — Closed mixing / loading, single layer clothing, chemical resistant gloves.

3, 4, 5, 6, 7 — Enclosed cab, single layer clothing, no gloves.

8, 9 — Enclosed truck (98% Protection Factor), single layer clothing, no gloves.

h Daily Inhalation Dose (mg/kg/day) = ((Inhalation Unit Exposure (mg/lb ai) * Application Rates (lb ai/A) * Area Treated per day (acres)) / Body Weight (70 kg))

Table 6: Occupational Exposure Scenario Descriptions for the Use of Methyl Parathion

Exposure Scenario (Number)	Data Source	Standard Values[a] (8-hr work day)	Comments[b]
Mixer/Loader Exposure			
Mixing/Loading Liquid Formulations (1 a and 1b) (emulsifiable concentration formulation)	PHED V1.1	350 acres for aerial and 80 acres for groundboom,	**Baseline:** "Best Available" grades: Hands, dermal, and inhalation based on acceptable grades. Dermal = 25 to 122 replicates; hands = 53 replicates; and inhalation= 85 replicates. High confidence in all data. **PPE:** "Best Available" grades: Hands, dermal, and inhalation = acceptable grades. Dermal = 25 to 122 replicates; hands = 59 replicates; and inhalation = 85 replicates. High confidence in all data. **Engineering Controls:** "Best Available" grades: Hands, dermal, and inhalation = acceptable grades; Dermal = 16 to 22 replicates; hands = 31 replicates; and inhalation = 27 replicates. High confidence in all data. PHED data were used for baseline, no protection factors (PFs) were necessary. A 50% PF was added to simulate coveralls for PPE. An 80% PF was used for PPE for inhalation to represent a dust/mist respirator. Engineering Controls data were monitored with chemical resistant gloves.
Mixing/Loading Liquid Formulations (2a, 2b, 2c) (microencapsulated formulation)	PHED V1.1	350 acres for aerial and chemigation, 80 acres for groundboom, and 40 acres for airblast.	**Baseline:** "Best Available" grades: Hands, dermal, and inhalation based on acceptable grades. Dermal = 25 to 122 replicates; hands = 53 replicates; and inhalation= 85 replicates. High confidence in all data. **PPE:** "Best Available" grades: Hands, dermal, and inhalation = acceptable grades. Dermal = 25 to 122 replicates; hands = 59 replicates; and inhalation = 85 replicates. High confidence in all data. **Engineering Controls:** "Best Available" grades: Hands, dermal, and inhalation = acceptable grades; Dermal = 16 to 22 replicates; hands = 31 replicates; and inhalation = 27 replicates. High confidence in all data. PHED data were used for baseline, no protection factors (PFs) were necessary. A 50% PF was added to simulate coveralls for PPE. An 80% PF was used for PPE for inhalation to represent a dust/mist respirator. Engineering Controls data were monitored with chemical resistant gloves. No PHED data was available for microencapsulate formulations; therefore, PHED for liquids was used as a surrogate.

Exposure Scenario (Number)	Data Source	Standard Values[a] (8-hr work day)	Comments[b]
Applicator Exposure			
Applying Liquids with Aerial Equipment (3, 4)	PHED V1.1	350 acres	**Engineering controls:** "Best Available" grades: Dermal and inhalation = ABC grades; and hands = acceptable grades. Dermal = 24 to 48 replicates; hands = 34 replicates; and inhalation = 23 replicates. Medium confidence in all data. PHED data were used for baseline, no PFs were necessary.
Groundboom Application (5, 6)	PHED V1.1	80 acres	**Baseline:** "Best Available" grades: Hands and dermal, and inhalation = acceptable grades. Dermal = 32 to 42 replicates; hands = 29 replicates; and inhalation = 22 replicates. High confidence in all data. **PPE:** "Best Available" grades: Dermal and inhalation= acceptable grades; hands = ABC grades. Dermal = 32 to 42 replicates; hands = 21 replicates; and inhalation= 22 replicates. Medium confidence in dermal and hands data. High confidence in inhalation data. **Engineering Controls:** "Best Available" grades: Dermal and hands = ABC grades. Dermal = 20 to 31 replicates; hands = 16 replicates. Medium confidence in dermal and hands data. High confidence in inhalation data. PHED data were used for baseline, no PFs were necessary. A 50% PF was added to the PPE scenario only to simulate coveralls.
Applying Liquids with an Airblast Sprayer (7)	PHED V1.1	40 acres	**Baseline:** "Best Available" grades = Hands, dermal, and inhalation = acceptable grades. Dermal = 32 to 49 replicates; hands = 22 replicates; and inhalation = 47 replicates. High confidence in all data. **PPE:** "Best Available" grades = Hands, dermal, and inhalation = acceptable grades. Dermal = 32 to 49 replicates; hands = 18 replicates; and inhalation = 47 replicates. High confidence in all data. **Engineering Controls:** "Best Available" grades: Hands and dermal = acceptable grades; and inhalation= ABC grades. Dermal = 20 to 30 replicates; hands = 20 replicates; and inhalation = 9 grades. High confidence in dermal data. Low confidence in inhalation data. No PFs were used for baseline data. A 50 percent PF was used for PPE to simulate coveralls. Engineering Controls data were monitored with chemical resistant gloves. 80% PF for the addition of a dust/mist respirator.

Exposure Scenario (Number)	Data Source	Standard Values[a] (8-hr work day)	Comments[b]
Flagger Exposure			
Flagging Aerial Spray Applications (8, 9)	PHED V1.1	350 acres	**Baseline:** "Best Available" grades: Hands, dermal, and inhalation = acceptable grades. Hands = 16 replicates; dermal = 16 to 18 replicates; and inhalation = 18 replicates. High confidence in dermal, hands, and inhalation data. **PPE:** "Best Available" grades: Hands, dermal, and inhalation = acceptable grades. Hands = 2 replicates; dermal = 16 to 18 replicates; and inhalation = 18 replicates. High confidence in dermal and inhalation data. Low confidence in hands data. **Engineering Controls:** Same as baseline. PHED data were used for baseline, no PFs were necessary. A 50% PF was added for PPE to represent coveralls. 80% PF for addition of a dust/mist respirator. A 98 percent PF was applied to baseline to simulate engineering controls.

Footnotes

[a] Standard Values based on an 8-hour work day as estimated by EPA. BEAD data were not available.

[b] "Best Available" grades are defined by EPA SOP for meeting Subdivision U Guidelines. Acceptable grades are matrices with grades A and B data. Data confidence are assigned as follows:

- High = grades A and B and 15 or more replicates
- Medium = grades A, B, and C and 15 or more replicates
- Low = grades A, B, C, D, and E or any combination of grades with less than 15 replicates

Post Application:

Chemical-specific postapplication exposure and/or environmental fate data have not yet been submitted by the registrant in support of reregistration of all formulation types of methyl parathion. In lieu of these data, a surrogate rangefinder postapplication assessment was conducted to determine potential risks for the representative crops used in the handler exposure assessment section. Current restricted-entry intervals are set in accordance with the Worker Protection Standard, 40 CFR Part 170, for most formulations. These interim restricted-entry intervals are 48 hour, except for areas receiving less than 25 inches of average rainfall per year. In these low rainfall areas the restricted-entry interval is 72 hours.

Microencapsulate Formulation

Pre Mitigation Uses

The surrogate assessment uses a typical transfer coefficient (Tc) for tree crops (peaches, apples and pears) of 10,000 cm^2/hr, from activities such as harvesting and pruning, a typical transfer coefficient for grapes of 15,000 cm^2/hr, from activities such as harvesting and hand girdling[6]. The dislodgeable foliar residue (DFR) value is derived from the various application rates using an estimated 20 percent of the rate applied as initial dislodgeable residues, and an estimated 25 percent dissipation rate per day. The dissipation half-life of the microencapsulated formulation is 1 to 2 days (based on environmental fate data supplied by EFED). A half-life of 1 to 2 days has also been suggested for the oxon of methyl parathion, depending upon the crop and climate.[7] The estimated dissipation rate of 25 percent per day is intended to approximate this half-life. For grapes the registrant's proposed application rate is 1.5 lbs ai/acre and the current maximum label rate is 3.0 lbs/acre, and for apples, pears and peaches is 2.0 lbs ai/acre. The equations used for the calculations in Table 7 are presented below:

$$DFR\left(\frac{\mu g}{cm^2}\right) = AR\left(\frac{lb\ ai}{A}\right) \times CF\left(\frac{\mu g/cm^2}{lb\ ai/A}\right) \times F \times (1-DR)^t$$

Where:

AR = Application rate is 1.5 and 3.0 lb ai/A for grapes and 2.0 lb/A for tree crops
DR = Daily dissipation rate (25 percent / day)
t = Days after treatment
CF = Conversion factor (11.2 lb per cm^2/lb per A)
F = Fraction retained on foliage (20 percent)

$$Dose\ (mg/kg/d) = \frac{DFR\ (\mu g/cm^2)\ x\ Tc\ (cm^2/hr)\ x\ CF\left(\frac{1\ mg}{1{,}000\ \mu g}\right)\ x\ Abs\ x\ ED\ (hrs)}{BW\ (kg)}$$

Where:

DFR = Initial DFR or daily DFR (μg/cm^2)
Tc = Transfer coefficient (10,000 cm^2/hr or 15,000 cm^2/hr)
CF = Conversion factor (1 mg/1,000 μg)
Abs = Dermal absorption (100 percent)
ED = Exposure duration (8 hours per day)
BW = Body weight (70 kg)

$$MOE = \frac{NOEL\ (mg/kg/d)}{Dose\ (mg/kg/d)}$$

Where:

NOAEL = 0.11 mg/kg/day
Dose = Calculated dose

Table 7. Methyl Parathion Intermediate-Term Surrogate Postapplication Assessment for Tree Crops and Grapes (Range Finder).

DAT[a]	DFR (µg/cm^2)[b]			Dermal Dose (mg/kg/day)[c]			MOE[d]		
	Pears, Apples, and Peaches	Grapes[e]		Pears, Apples, and Peaches	Grapes[e]		Pears, Apples, and Peaches	Grapes[e]	
		Registrant	Label		Registrant	Label		Registrant	Label
0	4.5	3.4	6.7	5.1	5.8	12	0	0	0
30	0.00080	0.00060	0.0012	0.0009	0.00010	0.0021	107	120	53
33	NA	NA	0.00051	NA	NA	0.00087	NA	NA	130

NA = Not applicable
[a] DAT = Days after treatment
[b] Initial DFR (μg/cm^2) = Application rate (1.5 and 3/0 lb ai/A for grapes and 2.0 lb ai/A for tree crops) x Conversion factor (1 lb ai/acre= 11.209 ug/cm2) x Fraction of initial ai retained on foliage

$$Daily\ Dissipation\ DFR = AR\left(\frac{lb\ ai}{A}\right)\ x\ (1 - daily\ DFR)^{(1\ -\ D)T}\ x\ CF\left(\frac{\mu g\ per\ cm^2}{lb\ per\ A}\right)\ x\ FI$$

Where: Assumed percent DFR after initial treatment is 20%, and each day after the percent dissipation per day is 25%.

[c] Dose = DFR (μg/cm^2) x Transfer coefficient (10,000 for tree crops, 15,000 cm^2/hr for grapes) x Conversion factor (1mg/1000 ug) x Dermal absorption (1) x Hrs worked per day (8 hrs) / Body weight (70 kg)
[d] MOE = NOAEL (mg/kg/day) / Dermal dose (mg/kg/day). Where: NOAEL is 0.11 mg/kg/day.
[e] Both the registrant's proposed application rate of 1.5 lbs ai/acre and the maximum label application rate of 3.0 lbs ai/acre were used for grapes.

Post Mitigation Uses

The surrogate assessment uses a typical transfer coefficient (Tc) for nut crops (pecans, walnuts and almonds) of 10,000 cm^2/hr, from activities such as harvesting (i.e. shaking, raking, pole and picking up) and pruning[6]. The dislodgeable foliar residue (DFR) value is derived from the various application rates using an estimated 20 percent of the rate applied as initial dislodgeable residues, and an estimated 25 percent dissipation rate per day. The dissipation half-life of the microencapsulated formulation is 1 to 2 days (based on environmental fate data supplied by EFED). A half-life of 1 to 2 days has also been suggested for the oxon of methyl parathion, depending upon the crop and climate.[7] The estimated dissipation rate of 25 percent per day is intended to approximate this half-life. The application rate for pecans, walnuts, and almonds is 2.0 lbs ai/acre. The equations used for the calculations in Table 8 are presented below:

$$DFR\left(\frac{\mu g}{cm^2}\right) = AR\left(\frac{lb\ ai}{A}\right) \times CF\left(\frac{\mu g/cm^2}{lb\ ai/A}\right) \times F \times (1-DR)^t$$

Where:

AR = Application rate is 2.0 lb/A for nut crops
DR = Daily dissipation rate (25 percent / day)
t = Days after treatment
CF = Conversion factor (11.2 lb per cm^2/lb per A)
F = Fraction retained on foliage (20 percent)

$$Dose\ (mg/kg/d) = \frac{(DFR\ (\mu g/cm^2) \times Tc\ (cm^2/hr) \times CF\left(\frac{1\ mg}{1{,}000\ \mu g}\right) \times Abs \times ED\ (hrs)}{BW\ (kg)}$$

Where:

DFR = Initial DFR or daily DFR (μg/cm^2)

Tc = Transfer coefficient (10,000 cm^2/hr)
CF = Conversion factor (1 mg/1,000 μg)
Abs = Dermal absorption (100 percent)
ED = Exposure duration (8 hours per day)
BW = Body weight (70 kg)

$$MOE = \frac{NOEL\ (mg/kg/d)}{Dose\ (mg/kg/d)}$$

Where:

NOAEL = 0.11 mg/kg/day
Dose = Calculated dose

Table 8. Methyl Parathion Intermediate-Term Surrogate Postapplication Assessment for Nut Crops (Range Finder).

DAT[a]	DFR (µg/cm^2)[b]	Dermal Dose (mg/kg/day)[c]	MOE[d]
	Walnuts, Pecans, and Almonds	Walnuts, Pecans, and Almonds	Walnuts, Pecans, and Almonds
0	4.5	5.1	0
30	0.00080	0.0009	107

NA = Not applicable
[a] DAT = Days after treatment
[b] Initial DFR (μg/cm^2) = Application rate (2.0 lb ai/A for nut crops) x Conversion factor (1 lb ai/acre= 11.209 ug/cm2) x Fraction of initial ai retained on foliage

$$Daily\ Dissipation\ DFR = AR\left(\frac{lb\ ai}{A}\right) x\ (1 - daily\ DFR)^{(1-D)^T} x\ CF\left(\frac{\mu g\ per\ cm^2}{lb\ per\ A}\right) x\ FI$$

Where: Assumed percent DFR after initial treatment is 20%, and each day after the percent dissipation per day is 25%.

[c] Dose = DFR (μg/cm^2) x Transfer coefficient (10,000 for nut crops) x Conversion factor (1mg/1000 ug) x Dermal absorption (1) x Hrs worked per day (8 hrs) / Body weight (70 kg)
[d] MOE = NOAEL (mg/kg/day) / Dermal dose (mg/kg/day). Where: NOAEL is 0.11 mg/kg/day.

Emulsifiable Concentrate Formulation

The post application assessment for the emulsifiable concentrate formulation is the same for the pre mitigation uses and the post mitigation uses. The surrogate assessment uses a typical transfer coefficient (Tc) for cotton of 1,000 cm^2/hr for scouting in the early season and 4,000 cm^2/hr for scouting in the late season[6]. Since dissipation rate is chemical specific, the DFR date was derived from a open literature study done with methyl parathion[8]. The DFR data were derived by combining the amount of methyl parathion with the amount of methyl paraoxon that was present on the foliage each day, after an initial application of 1.0 lbs ai/acre. Since the application rates for cotton is 3.0 lbs ai/acre, are greater than 1.0 lbs ai/acre, the initial amount found on the leaf on day 0 was multiplied by the application rate of the crop. The data were log transferred and a regression analysis was done. The dissipation was determined from the regression data to be 63 percent per day. The predicted DFR were then determined using this dissipation rate, starting at day 0. The predicted DFR data were then used to obtain the dose for each day. The equations used for the calculations in Table 9 are presented below:

$$Dose\ (mg/kg/d) = \frac{(DFR\ (\mu g/cm^2)\ x\ Tc\ (cm^2/hr)\ x\ CF\left(\frac{1\ mg}{1{,}000\ \mu g}\right)\ x\ Abs\ x\ ED\ (hrs)}{BW\ (kg)}$$

Where:

DFR = Initial DFR or daily DFR (μg/cm^2)
Tc = Transfer coefficient (1,000 cm^2/hr and 4,000 cm^2/hr)
CF = Conversion factor (1 mg/1,000 μg)
Abs = Dermal absorption (100 percent)
ED = Exposure duration (8 hours per day)
BW = Body weight (70 kg)

$$MOE = \frac{NOEL\ (mg/kg/day)}{Dose\ (mg/kg/day)}$$

Where:

NOAEL = 0.11 mg/kg/day
Dose = Calculated dose

Table 9. Methyl Parathion Intermediate-Term Surrogate Postapplication Assessment for Cotton (Range Finder).

DAT[a]	DFR (µg/cm^2)[b]	Dermal Dose (mg/kg/day)[c]		MOE[d]	
	Cotton	Cotton, scouting - early season	Cotton, scouting - late season	Cotton, scouting - early season	Cotton scouting - late season
0	9.2	1.1	4.2	0.1	0.0
7	0.0090	0.001	0.0041	110	27
9	0.0012	N/A	0.00056	N/A	200

Footnotes

NA = Not applicable

[a] DAT is "days after treatment"

[b] Predicted DFR was obtained through study data of the insecticide residues on cotton foliage[6]. The natural log was taken of the actual data and a regression analysis was done. This produced a dissipation rate and the predicted DFR values.

[c] Dose = DFR (μg/cm^2) x Transfer coefficient (1,000 and 4,000 cm^2/hr) x Conversion factor (1mg/1000 g) x Dermal absorption (1) x Hrs worked per day (8 hrs) / Body weight (70 kg)

[d] MOE = NOAEL (mg/kg/day) / Dermal dose (mg/kg/day). Where: intermediate NOAEL is 0.11 mg/kg/day.

Summary

Combined Dermal and Inhalation Risk from Handler Exposures

While the MOEs for the pre mitigation uses and the post mitigation uses vary, the scenarios that are a risk of concern are the same for both dermal and inhalation exposures were combined and risk was calculated for each exposure scenario using the short and intermediate term dermal and inhalation NOAEL of 0.11 mg/kg/day The acceptable MOE is 100. The calculations of risk based on combined dermal and inhalation exposure indicate that the MOEs are **not more than 100** even with maximum risk reduction measures for **all** of the short and intermediate term scenarios listed **except** the following:

- Flagging aerial spray applications with engineering controls for the emulsifiable concentration formulation at the 0.375 lbs ai/acre application rate (MOE = 260).

- Flagging aerial spray applications with engineering controls for the microencapsulated formulation at the 0.5 lbs ai/acre application rate (MOE = 190).

One of the registrants has stated that they are not supporting the use of human flaggers. However, HED has included the risk to flaggers in this assessment because some current labels allow the use of flaggers. In order for this assessment to be dropped, all labels must be modified to specify that human flaggers are prohibited.

Post-application Exposure

Microencapsulate Formulation

The resulting surrogate postapplication assessment for pre mitigation uses indicates that:

- MOEs equal or exceed 100 for grapes at the registrant suggested application rate of 1.5 lb ai/A with a dermal transfer of 15,000 cm^2/hr at the 30^{th} day following application.

- MOEs equal or exceed 100 for grapes at the current label application rate of 3.0 lb ai/A with a dermal transfer of 15,000 cm^2/hr at the 33^{rd} day following application.

- MOEs equal or exceed 100 for tree crops such as pears, apples and peaches with a dermal transfer of 10,000 cm^2/hr at the 30^{th} day following application.

The resulting surrogate postapplication assessment for the post mitigation uses indicates that:

- MOEs equal or exceed 100 for nut crops including pecans, almonds and walnuts with a dermal transfer of 10,000 cm^2/hr at the 30^{th} day following application.

Emulsifiable Concentrate Formulation

The post application assessment for the emulsifiable concentrate formulation is the same for the pre mitigation uses and the post mitigation uses. The surrogate postapplication assessment indicates that:

- MOEs equal or exceed 100 for cotton - early season, with a dermal transfer of 1,000 cm^2/hr on the 7^{th} day after application.

- MOEs equal or exceed 100 for cotton - late season, with a dermal transfer of 4,000 cm^2/hr on the 9^{th} day after application.

Residential Exposure and Risk Assessment for the Use of Methly Parathion

Although methyl parathion is a restricted use pesticide that is only to be applied by certified applicators, HED believes that residential exposures may occur in several situations. First, residential exposures may occur from the use of methyl parathion as a mosquito control agent. These exposures and risks are addressed later in this document. Second, even though methyl parathion is a restricted use pesticide and some (but not all) labels state "Not for home use", the possibility exists for residential post-application exposure from commercial application of methyl parathion to homeowner orchards. HED believes that this occurs infrequently and that the risks from this situation may be best addressed by changes in label language to explicitly state that the use of methyl parathion around residences is prohibited. Finally, residential exposures may result from spray drift from the aerial application of methyl parathion to agricultural fields. HED believes that these exposures may occur frequently with increasing urban encroachment on agricultural lands.

HED did not quantitatively assess the exposures and risks to individuals who live adjacent to farm fields and that could potentially be exposed to methyl parathion from spray drift. Methods to assess these risks are currently being developed by the Agency, and these assessments will be conducted in the future when these methods are available. However, based on current information, HED remains concerned about the potential risks from this source.

Mosquito Control

A quantitative exposure and risk assessment for mosquito control has not be completed as part of this document. The magnitude of the occupational and residential cannot currently be estimated because HED lacks necessary data. Guideline studies that would fill in these data gaps are as follows:

Applicator Exposure

- 875.1100 Dermal Exposure -- Outdoor
- 875.1300 Inhalation Exposure -- Outdoor
- 875.1500 Biological Monitoring

Postapplication Exposure

- 875.2100 Foliar Dislodgeable Residue Dissipation
- 875.2200 Soil Residue Dissipation
- 875.2400 Dermal Exposure
- 875.2500 Inhalation Exposure
- 875.2600 Biological Monitoring

Spray Drift

- 835.1100 Spray Droplet Size Spectrum
- 835.4100 Field Volatility From Soil
- 835.4200 Spray Drift Field Deposition

References

1) Methyl parathion labels.

2) U.S. EPA. Methyl parathion LUIS Table for Exposure Assessors. PRD Report, July 2, 1997; Report Run, August 22, 1997.

3) Methyl parathion (o,o-dimethyl o-p-nitrophenyl phosphorothioate): Hazard Identification Committee Report, Health Effects Division, Office of Pesticide Program, March 23, 1999.

4) HED Science Advisory Council for Exposure, Policy 007, *Use of Values from the PHED Surrogate Table and Chemical-Specific Data*. Health Effects Division, Office of Pesticide Programs, January 1999.

5) PHED Surrogate Exposure Guide. Health Effects Division, Office of Pesticide Program, August 1998.

6) HED Science Advisory Council for Exposure, Policy 003. *Agricultural Default Transfer Coefficients*. Health Effects Division, Office of Pesticide Programs, May 7, 1998.

7) Popendorf, W. 1985. Reentry Simulation Study, Phase 1. Draft Report.

8) Buck, N.A., B.J. Estesen, and G.W. Ware. Dislodgable Residues on Cotton Foliage: Fenvalarate, Permethrin, Sulprofos, Chlorpyrifos, Methyl Parathion, EPN, Oxymyl, and Profenfos. Bulletin of Environmental Contaminant Toxicology. Volume 24. Pages 283-288. 1980.

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OREB Files